Formularium PoEfS

Let $p(x)$ be your willingness to pay, $u(x)$ your utility, then $u'(x) = p(x)$
Consumer Surplus: $CS = u(x) - p(x) = \int_0^{x*} p(x) - p_x dx$. Maximising this gives: $\frac{\partial CS}{\partial x} = u'(x) - p = 0$.
Deadweight loss: $\Delta = \int_{x'}^{x*} p'(x) - c'(x)dx$
Let $c(x)$ be the cost of producing x goods, $\pi(x)$ be the profit. Then $\pi(x) = px - c(x)$.
Let GFT be the Gains From Trade, then $GFT = CS + \pi$. In perfect competition: $\pi = CS$.
Let ϵ be the price elasticity of demand. Then $\varepsilon = -\frac{p}{X_D(p)} X'_D(p)$.

⇒ Measures by how many percent demand decreases if the price increases by one percent. $\begin{cases} \varepsilon < 1 : \text{inelastic} \\ \varepsilon > 1 : \text{elastic} \end{cases}$

Avg product of capital: $\frac{x}{K} = \frac{f(K,L)}{K}$, avg product of labour: $\frac{x}{L} = \frac{f(K,L)}{L}$
Marginal product of capital, labour respectively: $\frac{\partial f(K,L)}{\partial K}$, $\frac{\partial f(K,L)}{\partial L}$
Elasticity of output with respect to capital, labour: $\eta_K = \frac{K}{x}\frac{\partial f(K,L)}{\partial K}$, $\eta_L = \frac{L}{x}\frac{\partial f(K,L)}{\partial L}$
Cobb-Douglas Production Function: $x = AK^\alpha L^\beta$
The expression $-\frac{dL}{dk}$ is called the marginal rate of substitution of labour for capital
Let the price of capital K be r and the price of labour L be w then $\pi(x) = f(K,L)p - rK - wL$.
Let A be the value today, V the value in one period from now, then $A = \frac{V}{(1+r)^t}$ (Present Value Analysis)
Suppose an asset pays M in each of the next T periods. The Present Discounted Value (PDV) is given by $\frac{M}{r}[1 - \frac{1}{(1+r)^{T+1}}]$.
Let M be the budget. The Lagrangian for utitility maximisation: $L(x, y, \lambda) = u(x, y) - \lambda(xp_x + yp_y - M)$
Marginal rate of substitution: $-\frac{\partial u(x,y)}{\partial x} / \frac{\partial u(x,y)}{\partial y}$
Markup of a monopolistic firm (Lerner index): $\frac{1}{\varepsilon} = \frac{p^m - c'(x^m)}{p^m}$ $\begin{cases} \frac{1}{\varepsilon} \approx 0 : \text{Perfect Competition (no market power)} \\ \frac{1}{\varepsilon} \approx 1 : \text{Demand is perfectly inelastic (much market power)} \end{cases}$

Monopoly: $p(x) + xp'(x) = c'(x)$ (Marginal Revenue = Marginal Costs)
Perfect Competition: $p = c'(x)$ (Price = Marginal Costs)
Oligopolistic competition (Cournot): derive based on quantity ($Q = q_1 + q_2$). Equal MC implies $q_1 = q_2$.
Oligopolistic competition (Bertrand): $\pi(x) = 0$ (Bertrand trap), Marginal Revenue still equal to Marginal Costs.

⇒ Set price just below Marginal Cost of the other firm and get entire market